Claims

1. A method for wetting a substrate with a fluid, comprising the steps

   a) providing a substrate having a surface to be wetted;

   b) providing a wetting fluid;

   c) applying to the substrate a protective layer that separates the surface to be wetted from the surroundings;

   d) patterning the protective layer to expose predetermined wetting areas on the substrate surface to be wetted; and

   e) applying the wetting fluid to the exposed wetting areas by means of a wetting apparatus without direct contact between the wetting apparatus and the substrate surface to be wetted.

2. The method according to claim 1, characterized in that as the substrate is provided a solid consisting of plastic, metal, semiconductor, glass, composite or porous material or consisting of a combination of these materials.

3. The method according to claim 1 or 2, characterized in that as the substrate is provided a solid whose surface to be wetted is formed by a silicon layer, a platinum layer, a gold layer, by an oxidic surface or a glass.

4. The method according to one of the preceding claims, characterized in that as the substrate is provided a macroscopic solid disk, or a micro- or nanoparticle.

5. The method according to one of the preceding claims, characterized in that as the wetting fluid is provided a purely liquid substance, a solution of organic and/or inorganic substances, an emulsion, a suspension or a colloidal solution.

6. The method according to one of the preceding claims, characterized in that the material of the protective layer is so coordinated with the substrate material that the protective layer material is physisorbed or chemisorbed on the substrate surface to be wetted, or bound to it covalently, coordinatively or by complex formation.

7. The method according to one of the preceding claims, characterized in that as the protective layer, a positive or negative photoresist is applied to the substrate, preferably is sprayed on or spun on.

8. The method according to one of claims 1 to 6, characterized in that as the protective layer is applied to the substrate a solder resist, preferably that the solder resist is applied by screen printing, curtain coating or a spraying method.

9. The method according to one of claims 1 to 6, characterized in that as the protective layer is applied to the substrate an organic polymer, especially consisting of cellulose, dextran or collagen, preferably that the organic polymer is spun on or applied by physisorption.

10. The method according to one of claims 1 to 6, characterized in that as the protective layer is applied a self-assembled monolayer consisting of organic molecules.

11. The method according to claim 10, characterized in that the self-assembled monolayer is applied in that the organic molecules are dissolved in an aqueous or organic solvent and the solution is brought into contact with the substrate.

12. The method according to claim 10 or 11, characterized in that
   - as the substrate is provided a solid whose surface to be wetted is formed by a gold layer, and that
   - as the protective layer is applied a self-assembled monolayer consisting of thiols, especially having the general structure HS-spacer-R or [S-spacer-R]$_2$, wherein R is any headgroup and the spacer has a chain length of 1 – 20, especially 1 – 14.

13. The method according to claim 10 or 11, characterized in that
   - as the substrate is provided a solid whose surface to be wetted is formed by a silicon or platinum layer, and that
   - as the protective layer is applied a self-assembled monolayer consisting of amines, especially having the general structure H_2N-spacer-R, wherein R is any headgroup and the spacer has a chain length of 1 – 20, especially 1 – 14.

14. The method according to claim 10 or 11, characterized in that
   - as the substrate is provided a solid whose surface to be wetted is formed by an oxidic surface or a glass, and that

- as the protective layer is applied a self-assembled monolayer consisting of silanes, especially having the general structure X_3-Si-spacer-R, wherein R is any headgroup and X = H, Cl or OCH_3 and the spacer has a chain length of 1 – 20, especially 1 – 14.

15. The method according to one of claims 12 to 14, characterized in that R = CH_3, OH, CO_2H, NH_2, NH_3^+ or SO_3^-.

16. The method according to one of the preceding claims, characterized in that the protective layer in step c) is applied in the form of a complete layer to the substrate surface to be wetted.

17. The method according to one of the preceding claims, characterized in that the protective layer is applied to the entire substrate surface to be wetted.

18. The method according to one of the preceding claims, characterized in that the protective layer is patterned by means of laser ablation, especially by irradiation of sub-regions of the protective layer with continuous or pulsed laser radiation of a predetermined wavelength.

19. The method according to claim 18, characterized in that the protective layer is pulsed with the laser radiation directly, through a lens system or through a mask in order to expose the wetting areas.

20. The method according to claim 18 or 19, characterized in that due to the laser radiation, the substrate surface to be wetted is melted in the region of the wetting areas.

21. The method according to one of the preceding claims, characterized in that the protective layer is removed without residue in the region of the wetting areas.

22. The method according to one of the preceding claims, characterized in that the wetting areas are created with a characteristic dimension of about 5 µm to about 200 µm, preferably of about 10 µm to about 100 µm.

23. The method according to claim 22, characterized in that the wetting areas are created at a lateral spacing of about 20 µm to about 500 µm, preferably of about 50 µm to about 200 µm.

24. The method according to one of the preceding claims, characterized in that the wetting areas are created with a substantially rectangular, elliptical or circular contour.

25. The method according to one of the preceding claims, characterized in that in the step of patterning the protective layer, supply channels are introduced into the protective layer to facilitate the supply of an analyte fluid to the exposed wetting areas.

26. The method according to claim 25, characterized in that the supply channels are introduced into the protective layer with a depth of 10% to 99%, preferably of 20% to 95%, particularly preferably of 50% to 95% of the thickness of the protective layer.

27. The method according to claim 25 or 26, characterized in that the exposed wetting areas are disposed within the supply channels.

28. The method according to one of the preceding claims, characterized in that the wetting apparatus comprises a single needle, capillary, tweezer, ring or stamp.

29. The method according to one of the preceding claims, characterized in that the wetting apparatus comprises an arrangement of multiple needles, capillaries, tweezers, rings, or stamps, or an arrangement of various of these elements.

30. The method according to one of the preceding claims, characterized in that the wetting apparatus exhibits a fluid-dispensing end surface whose lateral dimension in at least one direction in space is greater than the lateral dimension of the wetting area in that direction in space.

31. The method according to claim 30, characterized in that the end surface of the wetting apparatus exhibits in both directions in space a larger lateral dimension than the wetting areas.

32. The method according to claim 30 or 31, characterized in that for the application of the wetting fluid, the end surface of the wetting apparatus is, at one wetting area, brought into contact with the protective layer adjoining said wetting area.

33. The method according to one of claims 30 to 32, characterized in that for the application of the wetting fluid, the end surface of the wetting apparatus is, across the entire wetting area and from above, brought into contact with the surface of the protective layer adjoining the wetting area.

34. The method according to one of claims 30 to 33, characterized in that the end surface of the wetting apparatus is positionable laterally above a patterned protective layer with a precision (Δx, Δy), and the wetting areas are created with a characteristic lateral dimension (x_{spot},y_{spot}) that is smaller than the lateral dimension (x_{tip},y_{tip}) of the end surface of the wetting apparatus by at least the positioning precision (_x, _y).

35. The method according to one of the preceding claims, characterized in that as the wetting fluid, modified nucleic acid oligomers in aqueous solution are applied, the nucleic acid oligomers being modified with one or more reactive groups, and at least one reactive group being designed for a direct reaction with the substrate surface to be wetted.

36. The method according to claim 35, characterized in that the nucleic acid oligomers are modified with a fluorophore.

37. The method according to claim 35 or 36, characterized in that the nucleic acid oligomers in aqueous solution are applied with a detergent.

38. An apparatus for carrying out the method according to one of the preceding claims.

39. The apparatus according to claim 38, having a wetting apparatus whose end surface is positionable laterally above a patterned protective layer with a positioning precision of less than 50 µm, preferably of less than 10 µm.

40. A fluid-wetted substrate obtainable according to one of claims 1 to 37.